

1. A heat tolerant, pressure resistant elastomeric composition exhibiting improved hydrocarbon fluid impermeability, wherein said composition is useful in the manufacture of automotive hoses, belts, seals, dampers and engine mounts which require resistance to heat, pressure and hydrocarbon fluids, said composition comprising a copolymer containing a first vinyl ester and a second vinyl ester.
2. The composition of claim 1 wherein said first vinyl ester is a vinyl ester of a lower carboxylic acid and said second vinyl ester is a vinyl ester of a fatty acid.
3. The composition of claim 1 wherein said first vinyl ester is vinyl acetate and said second vinyl ester is vinyl laurate.
4. The composition of claim 1 wherein said elastomer composition comprises about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer.
5. The composition of claim 3 wherein said copolymer comprises about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate.
6. The composition of claim 3 further comprising 0 to about 75% by weight of an elastomeric polymer selected from the group consisting of an ethylene-vinyl ester of a C₂ to C₆ carboxylic acid, chlorinated polyolefin, chlorosulfonated polyolefin, polychloroprene, ethylene-acrylic rubber, alkyl acrylate copolymer, polyvinyl acetate, acrylonitrile-butadiene rubber, hydrogenated acrylonitrile-butadiene rubber, ethylene-propylene diene terpolymer, styrene-butadiene rubber, ethylene-propylene rubber, butyl rubber, cis-polybutadiene, cis-polyisoprene, polyurethane, polyamide and combinations thereof.
7. The composition of claim 6 wherein said elastomeric polymer is an ethylene-vinyl acetate copolymer comprising about 40 to 80% vinyl acetate and about 60 to 20% ethylene.

8. The composition of claim 1 further comprising about 25 to 75% one or more additives selected from the group consisting of process aids, fillers, plasticizers, metal oxides, metal hydroxides, peroxides, coagents, antioxidants and combinations thereof.

9. The composition of claim 8, wherein said composition comprises:

about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer;

about 0 to 75% by weight ethylene-vinyl acetate;

about 0.8 to 2% by weight one or more processing aids selected from the group consisting of stearic acid, stearates, 1-octanedecanamine, polyethylene, amines, oils, organic esters, organic phosphate esters and combinations thereof;

about 20 to 60% by weight one or more fillers selected from the group consisting of carbon black, graphite, silicone dioxide, fumed silica, precipitated silica, diatomaceous earth, magnesium carbonate, calcium carbonate, magnesium silicate, aluminum silicate titanium dioxide, talc, mica, aluminum sulfate, calcium sulfate, wollastonite, molybdenum disulfide, clay, calcium carbonate and combinations thereof;

about 3 to 15% by weight one or more plasticizers selected from the group consisting of hydrocarbons, glycols, aldehydes, ethers, esters, ether-esters, trioctyl trimellitate and combinations thereof;

about 0 to 10% by weight one or more metal oxides and/or hydroxides selected from the group consisting of zinc oxide, zinc hydroxide, magnesium oxide, magnesium hydroxide, calcium oxide, calcium hydroxide, aluminum hydroxide and combinations thereof;

about 0.5 to 4% by weight one or more peroxides selected from the group consisting of 2,5-dimethyl-2,5-di(t-butylperoxy)hexyne-3; 2,5-dimethyl-2,5-di(t-butylperoxy)hexane; dicumyl peroxide; α,α' -bis-(t-butylperoxy)-p-diisopropylbenzene; di-t-butyl peroxide; 1,1-bis(t-butylperoxy)-3,3,5-trimethylcyclohexane; 2,4-dichlorobenzoyl peroxide; benzoyl peroxide; p-chlorobenzoyl peroxide; 4,4-bis(t-butylperoxy) valerate; t-butylcumyl peroxide; di-t-amyl peroxide; t-butyl hydroperoxide and combinations thereof;

about 0 to 5% by weight one or more coagents selected from the group consisting of maleimides, triallyl cyanurate, triallyl isocyanurate, diallyl terephthalate, 1,2-vinyl polybutadiene, di- and tri-functional methacrylates, diacrylates, metal ion versions thereof and combinations thereof; and

about 0 to 3% by weight one or more antioxidants selected from the group consisting of phenols, hydrocinnamates, hydroquinones, hydroquinolines, diphenylamines, mercaptobenzimidazoles and combinations thereof.

10. The composition of claim 9, wherein said composition comprises:

about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;

about 0.2 to 0.7% by weight stearic acid;

about 23 to 38% by weight carbon black;

about 2 to 5% by weight silicon dioxide;

about 3 to 7% by weight trioctyl trimellitate;

about 0 to 7% by weight adipate type plasticizer;

about 0 to 8% by weight magnesium oxide;

about 0.1 to 0.75% 1-octanedecanamine;

about 0.1 to 0.75% organic phosphate ester;

about 0.5 to 4% by weight organic peroxide;

about 0.25 to 1% by weight triallyl cyanurate;

about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;

about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.

11. The composition of claim 9, wherein said composition comprises:

about 5 to 30% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;

about 20 to 50% by weight ethylene-vinyl acetate copolymer containing about 50 to 80% vinyl acetate and about 80 to 50% ethylene;

about 0.2 to 0.7% by weight stearic acid;

about 23 to 38% by weight carbon black;

about 2 to 5% by weight silicon dioxide;

about 3 to 7% by weight trioctyl trimellitate;

about 0 to 7% by weight adipate type plasticizer;

about 0 to 8% by weight magnesium oxide;

about 0.1 to 0.75% 1-octanedecanamine;
about 0.1 to 0.75% organic phosphate ester;
about 0.5 to 4% by weight organic peroxide;
about 0.25 to 1% by weight triallyl cyanurate;
about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;
about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.

12. A vulcanized, heat tolerant, pressure resistant elastomeric automotive component exhibiting improved hydrocarbon fluid impermeability, wherein said component comprises a copolymer containing a first vinyl ester and a second vinyl ester.

13. The component of claim 12, wherein said first vinyl ester is a vinyl ester of a lower carboxylic acid and said second vinyl ester is a vinyl ester of a fatty acid.

14. The component of claim 13, wherein said first vinyl ester is vinyl acetate and said second vinyl ester is vinyl laurate.

15. The component of claim 14, wherein said hose comprises about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer.

16. The component of claim 14, wherein said copolymer comprises about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate.

17. The component of claim 12 further comprising about 0 to 75% by weight of an elastomeric polymer selected from the group consisting of an ethylene-vinyl ester of a C₂ to C₆ carboxylic acid, chlorinated polyolefins, chlorosulfonated polyolefins, polychloroprene, ethylene-acrylic rubber, alkyl acrylate copolymer, polyvinyl acetate, acrylonitrile-butadiene rubber, hydrogenated acrylonitrile-butadiene rubber, ethylene-propylene diene terpolymer, styrene-butadiene rubber, ethylene-propylene rubber, butyl rubber, cis-polybutadiene, cis-polyisoprene, polyurethane, polyamide and combinations thereof.

18. The component of claim 17 wherein said elastomeric polymer is an ethylene-vinyl acetate copolymer comprising about 40 to 80% vinyl acetate and about 60 to 20% ethylene.

19. The component of claim 12 further comprising about 25 to 75% one or more additives selected from the group consisting of process aids, fillers, plasticizers, metal oxides, metal hydroxides, peroxides, coagents, antioxidants and combinations thereof.

20. The component of claim 19 comprising:

about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer;

about 0 to 75% by weight ethylene-vinyl acetate;

about 0 to 8% by weight one or more processing aids selected from the group consisting of stearic acid, stearates, polyethylene, amines, oils and organic esters;

about 20 to 60% by weight one or more fillers selected from the group consisting of carbon black, graphite, silicone dioxide, fumed silica, precipitated silica, diatomaceous earth, magnesium carbonate, calcium carbonate, magnesium silicate, aluminum silicate titanium dioxide, talc, mica, aluminum sulfate, calcium sulfate, wollastonite, molybdenum disulfide, clay, calcium carbonate and combinations thereof;

about 3 to 15% by weight one or more plasticizers selected from the group consisting of hydrocarbons, glycols, aldehydes, ethers, esters, ether-esters and combinations thereof;

about 0 to 10% by weight one or more metal oxides and/or hydroxides selected from the group consisting of zinc oxide, zinc hydroxide, magnesium oxide, magnesium hydroxide, calcium oxide, calcium hydroxide, aluminum hydroxide and combinations thereof;

about 0.5 to 4% by weight one or more peroxides selected from the group consisting of 2,5-dimethyl-2,5-di(t-butylperoxy)hexyne-3; 2,5-dimethyl-2,5-di(t-butylperoxy)hexane; dicumyl peroxide; α,α' -bis-(t-butylperoxy)-p-diisopropylbenzene; di-t-butyl peroxide; 1,1-bis(t-butylperoxy)-3,3,5-trimethylcyclohexane; 2,4-dichlorobenzoyl peroxide; benzoyl peroxide; p-chlorobenzoyl peroxide; 4,4-bis(t-butylperoxy) valerate; t-butylcumyl peroxide; di-t-amyl peroxide; t-butyl hydroperoxide and combinations thereof;

about 0 to 5% by weight one or more coagents selected from the group consisting of maleimides, triallyl cyanurate, triallyl isocyanurate, diallyl terephthalate, 1,2-vinyl polybutadiene, di- and tri-functional methacrylates, diacrylates, metal ion versions thereof and combinations thereof; and

about 0 to 0.3% by weight one or more antioxidants selected from the group consisting of phenols, hydrocinnamates, hydroquinones, hydroquinolines, diphenylamines, mercaptobenzimidazoles and combinations thereof.

21. The component of claim 19, wherein said composition comprises:

about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;

about 0.2 to 0.7% by weight stearic acid;

about 23 to 38% by weight carbon black;

about 2 to 5% by weight silicone dioxide;

about 3 to 7% by weight trioctyl trimellitate;

about 0 to 7% by weight adipate type plasticizer;

about 0 to 8% by weight magnesium oxide;

about 0.1 to 0.75% 1-octanodecanamine;

about 0.1 to 0.75% organic phosphate ester;

about 0.5 to 4% by weight organic peroxide;

about 0.25 to 1% by weight triallyl cyanurate;

about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;

about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.

22. The component of claim 20, wherein said composition comprises:

about 5 to 30% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;

about 20 to 50% by weight ethylene-vinyl acetate copolymer containing about 50 to 80% vinyl acetate and about 80 to 50% ethylene;

about 0.2 to 0.7% by weight stearic acid;

about 23 to 38% by weight carbon black;

about 2 to 5% by weight silicone dioxide;

about 3 to 7% by weight trioctyl trimellitate;

about 0 to 7% by weight adipate type plasticizer;

about 0 to 8% by weight magnesium oxide;

about 0.1 to 0.75% 1-octanedecanamine;
about 0.1 to 0.75% organic phosphate ester;
about 0.5 to 4% by weight organic peroxide;
about 0.25 to 1% by weight triallyl cyanurate;
about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;
about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.

23. The component of claim 12 wherein said elastomeric automotive component is a tubular structure.

24. The component of claim 23 wherein said tubular structure further includes a reinforcing layer and/or a cover layer over an outer surface thereof, said reinforcing layer comprising natural or synthetic fibers selected from the group consisting of cotton, polyester, nylon, rayon and aramid; or metal wire, and said cover layer comprising a synthetic elastomeric selected from the group consisting of styrene-butadiene, chlorosulfonated polyethylene, epichlorohydrin-ethylene oxide copolymer, polyvinyl chloride, and blends thereof.

25. The component of claim 24 wherein said tubular structure includes:

a reinforcing layer over the outer surface of said tubular structure, said reinforcing structure comprising natural or synthetic fibers selected from the group consisting of cotton, polyester, nylon, rayon and aramid; or metal wire, and

a cover layer over the outer surface of said reinforcing layer, said cover layer comprising a synthetic elastomeric selected from the group consisting of styrene-butadiene rubber, butadiene-acrylonitrile rubber, chloroprene rubber, chlorinated polyethylene, chlorosulfonated polyethylene, epichlorohydrin-ethylene oxide copolymer, polyvinyl chloride, and blends thereof.

26. A method for preparing a vulcanized, heat tolerant, pressure resistant hose having improved hydrocarbon fluid impermeability, said method comprising:

providing an elastomeric composition comprising a copolymer containing a first vinyl ester and a second vinyl ester;

incorporating into said elastomeric composition, one or more additives selected from the group consisting of process aids, fillers, plasticizers, metal oxides, metal hydroxides, peroxides, coagents, antioxidants and combinations thereof;

forming a hose of said copolymer containing said additives; and
vulcanizing said hose.

27. The method of claim 26, wherein said first vinyl ester is vinyl acetate and said second vinyl ester is vinyl laurate.

28. The method of claim 27, wherein said elastomeric composition comprises about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer.

29. The method of claim 27, wherein said copolymer comprises about 50 to 80% vinyl acetate and about 50 to 20% by weight vinyl laurate.

30. The method of claim 26, further comprising 0 to about 75% by weight of an elastomeric polymer selected from the group consisting of a vinyl ester of a C₂ to C₆ carboxylic acid, chlorinated polyolefins, chlorosulfonated polyolefins, polychloroprene, ethylene-acrylic rubber, alkyl acrylate copolymer, polyvinyl acetate, acrylonitrile-butadiene rubber, hydrogenated acrylonitrile-butadiene rubber and combinations thereof.

31. The method of claim 30, wherein said elastomeric polymer is an ethylene-vinyl acetate copolymer comprising about 40 to 80% vinyl acetate and about 60 to 20% ethylene.

32. The method of claim of 26, wherein said composition comprises about 80 to 25% copolymer and about 25 to 75% by weight of one or more additives selected from the group consisting of process aids, fillers, plasticizers, metal oxides, metal hydroxides, peroxides, coagents, antioxidants and combinations thereof.

33. The method of claim 26, comprising:

providing an elastomeric composition comprising about 2 to 75% by weight of a vinyl acetate-vinyl laurate copolymer containing about 50 to 80% by weight of a vinyl acetate and

about 50 to 20% by weight vinyl laurate, and 0 to about 75% by weight of an ethylene-vinyl acetate copolymer containing about 40 to 80% vinyl acetate and about 60 to 20% by weight ethylene;

incorporating into said elastomeric composition one or more additives comprising:

about 0.8 to 2% by weight one or more processing aids selected from the group consisting of stearic acid, stearates, polyethylene, amines, oils, organic esters, organic phosphate esters and combinations thereof;

about 20 to 60% filler selected from the group consisting of carbon black, silicon dioxide, fumed silica, precipitated silica, diatomaceous earth, magnesium carbonate, magnesium silicate, aluminum silicate titanium dioxide, talc, mica, aluminum sulfate, calcium sulfate, graphite, wollastonite, molybdenum disulfide, clay, calcium carbonate and combinations thereof;

about 3 to 15% plasticizer selected from the group consisting of hydrocarbons, glycols, aldehydes, ethers, esters, ether-esters and combinations thereof;

about 0 to 10% metal oxides and/or hydroxides selected from the group consisting of zinc oxide, zinc hydroxide, magnesium oxide, magnesium hydroxide, calcium oxide, calcium hydroxide, aluminum hydroxide and combinations thereof;

about 0.5 to 2% peroxide selected from the group consisting of 2,5-dimethyl-2,5-di(t-butylperoxy)hexyne-3; 2,5-dimethyl-2,5-di(t-butylperoxy)hexane; dicumyl peroxide; α,α' -bis(t-butylperoxy)-p-diisopropylbenzene; di-t-butyl peroxide; 1,1-bis(t-butylperoxy)-3,3,5-trimethylcyclohexane; 2,4-dichlorobenzoyl peroxide; benzoyl peroxide; p-chlorobenzoyl peroxide; t-butylcumyl peroxide; di-t-amyl peroxide; t-butyl hydroperoxide and combinations thereof;

about 0 to 5% coagent selected from the group consisting of maleimides, triallyl cyanurate, triallyl isocyanurate, diallyl terephthalate, 1,2-vinyl polybutadiene, di- and tri-functional methacrylates, diacrylates, and combinations thereof; and

about 0 to 0.3% antioxidant selected from the group consisting of phenols, hydrocinnamates, hydroquinones, hydroquinolines, diphenylamines, mercaptobenzimidazoles and combinations thereof;

applying a layer of reinforcing material over said composition;

forming a cover layer over said layer of reinforcing material providing a hose; and vulcanizing said hose.

34. The method of claim 29, wherein said composition comprises:
about 2 to 75% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;
about 0.2 to 0.7% by weight stearic acid;
about 23 to 38% by weight carbon black;
about 2 to 5% by weight silicon dioxide;
about 3 to 7% by weight trioctyl trimellitate;
about 0 to 7% by weight adipate type plasticizer;
about 0 to 8% by weight magnesium oxide;
about 0.1 to 0.75% 1-octanedecanamine;
about 0.1 to 0.75% organic phosphate ester;
about 0.5 to 4% by weight organic peroxide;
about 0.25 to 1% by weight triallyl cyanurate;
about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;
about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.
35. The method of claim 34, wherein said composition comprises:
about 5 to 30% by weight vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;
about 20 to 50% by weight ethylene-vinyl acetate copolymer containing about 50 to 80% vinyl acetate and about 80 to 50% ethylene;
about 0.2 to 0.7% by weight stearic acid;
about 23 to 38% by weight carbon black;
about 2 to 5% by weight silicone dioxide;
about 3 to 7% by weight trioctyl trimellitate;
about 0 to 7% by weight adipate type plasticizer;
about 0 to 8% by weight magnesium oxide;
about 0.1 to 0.75% 1-octanedecanamine;
about 0.1 to 0.75% organic phosphate ester;
about 0.5 to 4% by weight organic peroxide;
about 0.25 to 1% by weight triallyl cyanurate;

about 0.25 to 1% by weight N,N', n-phenylenedimaleimide;
about 0.25 to 2% by weight antioxidant selected from the group consisting of phenols, hydrocinnamates, diphenylamines, hydroquinones, hydroquinolines and mixtures thereof.

36. In a vulcanized hose for conveying fluids in an automotive engine cooler, transmission oil cooler, power transmission cooler, radiator or heater, the improvement which comprises employing as an inner tubular structure of a hose, a heat tolerant, pressure resistant composition exhibiting improved hydrocarbon fluid impermeability compared to conventional hose-forming compositions, wherein said composition comprises:

about 2 to 75% by weight of a vinyl acetate-vinyl laurate copolymer containing about 50 to 80% vinyl acetate and about 50 to 20% vinyl laurate;

about 0 to about 75% by weight of an ethylene-vinyl acetate copolymer containing about 40 to 80% vinyl acetate and about 60 to 20% ethylene;

about 0 to 8% by weight one or more processing aids;

about 20 to 60% by weight one or more fillers;

about 3 to 15% by weight one or more plasticizers;

about 0 to 10% by weight one or more metal oxides and/or hydroxides;

about 0.5 to 4% by weight one or more peroxides;

about 0 to 5% by weight one or more coagents; and

about 0 to 3% by weight one or more antioxidants,

said hose further including a reinforcing layer over said tubular structure, said reinforcing layer comprising natural or synthetic fibers selected from the group consisting of cotton, polyester, nylon, rayon and aramid; or metal wire, and a cover layer over said reinforcing layer, said cover layer comprising a synthetic elastomeric selected from the group consisting of styrene-butadiene rubber, butadiene-acrylonitrile rubber, chloroprene rubber, chlorinated polyethylene, chlorosulfonated polyethylene, epichlorohydrin-ethylene oxide copolymer, polyvinyl chloride, and blends thereof.